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### SEMESTER VII

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OBJECTIVE:
- To impart knowledge on the principle and design of control of Indoor/ particulate/ gaseous air pollutant and its emerging trends.

UNIT I INTRODUCTION
Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards.

UNIT II METEOROLOGY

UNIT III CONTROL OF PARTICULATE CONTAMINANTS

UNIT IV CONTROL OF GASEOUS CONTAMINANTS

UNIT V INDOOR AIR QUALITY MANAGEMENT
Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness- Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

OUTCOMES:
The students completing the course will have
- an understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
- ability to identify, formulate and solve air and noise pollution problems
- ability to design stacks and particulate air pollution control devices to meet applicable standards.
- Ability to select control equipments.
- Ability to ensure quality, control and preventive measures.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
At the end of the course, the student is expected to
- understand and analyse the energy data of industries
- carryout energy accounting and balancing
- conduct energy audit and suggest methodologies for energy savings and
- utilise the available resources in optimal ways

UNIT I INTRODUCTION

UNIT II ELECTRICAL SYSTEMS

UNIT III THERMAL SYSTEMS

UNIT IV ENERGY CONSERVATION IN MAJOR UTILITIES
Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets

UNIT V ECONOMICS
Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept

OUTCOMES:
Upon completion of this course, the students can able to analyse the energy data of industries.
- Can carryout energy accounting and balancing
- Can suggest methodologies for energy savings

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To emphasize on the importance of environment and agriculture on changing global scenario and the emerging issues connected to it.

UNIT I  ENVIRONMENTAL CONCERNS  8
Environmental basis for agriculture and food – Land use and landscape changes – Water quality issues – Changing social structure and economic focus – Globalization and its impacts – Agro ecosystems.

UNIT II  ENVIRONMENTAL IMPACTS  9
Irrigation development and watersheds – mechanized agriculture and soil cover impacts – Erosion and problems of deposition in irrigation systems – Agricultural drainage and downstream impacts – Agriculture versus urban impacts.

UNIT III  CLIMATE CHANGE  8

UNIT IV  ECOLOGICAL DIVERSITY AND AGRICULTURE  10

UNIT V  EMERGING ISSUES  10
Global environmental governance – alternate culture systems – Mega farms and vertical farms – Virtual water trade and its impacts on local environment – Agricultural environment policies and its impacts – Sustainable agriculture.

TOTAL: 45 PERIODS

OUTCOMES:
- Students will appreciate the role of environment in the current practice of agriculture and concerns of sustainability, especially in the context of climate change and emerging global issues.
- Ecological context of agriculture and its concerns will be understood

TEXTBOOKS:

REFERENCES:
3. Environment and agriculture: environmental problems affecting agriculture in the Asia and Pacific region; World Food Day Symposium, Bangkok, Thailand. 1989
OBJECTIVES:
- To introduce the fundamentals and components of Geographic Information System
- To provide details of spatial data structures and input, management and output processes.

UNIT I FUNDAMENTALS OF GIS

UNIT II SPATIAL DATA MODELS

UNIT III DATA INPUT AND TOPOLOGY

UNIT IV DATA ANALYSIS
Vector Data Analysis tools - Data Analysis tools - Network Analysis - Digital Education models - 3D data collection and utilisation.

UNIT V APPLICATIONS

OUTCOME:
This course equips the student to
- Have basic idea about the fundamentals of GIS.
- Understand the types of data models.
- Get knowledge about data input and topology.
- Gain knowledge on data quality and standards.
- Understand data management functions and data output

TEXT BOOKS:

REFERENCE:
OBJECTIVES:
The student should be made to:
- Know about the healthcare hazard control and accidents
- Understand biomedical waste management
- Learn the facility guidelines, infection control and patient safety.

UNIT I  HEALTHCARE HAZARD CONTROL AND UNDERSTANDING ACCIDENTS  9

UNIT II  BIOMEDICAL WASTE MANAGEMENT  9
Biomedical Waste Management: Types of wastes, major and minor sources of biomedical waste, Categories and classification of biomedical waste, hazard of biomedical waste, need for disposal of biomedical waste, waste minimization, waste segregation and labeling, waste handling and disposal.

UNIT III  HAZARDOUS MATERIALS  9

UNIT IV  FACILITY SAFETY  9

UNIT V  INFECTION CONTROL, PREVENTION AND PATIENT SAFETY  9

TOTAL : 45 PERIODS

OUTCOMES:
- After successful completion of the course, the students will be able to know the concepts of healthcare waste management, its prevention and safety.

REFERENCES:

OBJECTIVE:
- This course will be focussed on achievement, acquisition of knowledge and enhancement of comprehension of information regarding bioenergy and biofuel technologies and their sustainable applications.
UNIT I CONCEPTS
Biopower, Bioheat, Biofuels, advanced liquid fuels, drop-in fuels, biobased products

UNIT II FEEDSTOCKS

UNIT III CONVERSION TECHNOLOGIES
Biorefinery concept – biorefineries and end products, Biochemical conversion – hydrolysis, enzyme and acid hydrolysis, fermentation, anaerobic digestion and trans-esterification, Thermochemical conversion – Combustion, Gasification, Pyrolysis, other thermochemical conversion technologies. Scaling up of emerging technologies.

UNIT IV BIOFUELS
Pros and cons of Biofuels, Algal biofuels, Cyanobacteria and producers of biofuels, Jatropha as biodiesel producer, Bioethanol, Biomethane, biohydrogen, biobutanol, metabolic engineering of fuel molecules, Engineering aspects of biofuels, Economics of biofuels

UNIT V SUSTAINABILITY & RESILIENCE
Environmental Sustainability, bioenergy sustainability, emissions of biomass to power generation applications, emissions from biofuels. ILUC issues, Carbon footprint, Advanced low carbon fuels

TOTAL: 45 PERIODS

TEXTBOOKS:

REFERENCES:
2. Bioenergy: Biomass to Biofuels by by Anju Dahiya
3. Bioenergy: Principles and Applications by Yebo Li and Samir Kumar Khanal
4. Bioenergy by Judy D. Wall and Caroline S. Harwood
5. Bioenergy: Sustainable Perspectives by Ted Weyland

OA1552 PARTICIPATORY WATER RESOURCES MANAGEMENT

OBJECTIVE:
• To gain an insight on local and global perceptions and approaches on participatory water resource management

UNIT I FUNDAMENTALS: SOCIOLOGY AND PARTICIPATORY APPROACH
Sociology – Basic concepts – Perspectives- Social Stratification – Irrigation as a Socio technical Process - Participatory concepts– Objectives of participatory approach

UNIT II UNDERSTANDING FARMERS PARTICIPATION
UNIT III  ISSUES IN WATER MANAGEMENT  

UNIT IV  PARTICIPATORY WATER CONSERVATION  

UNIT V  PARTICIPATORY WATERSHED DEVELOPMENT  
Concept and significance of watershed - Basic factors influencing watershed development — Principles of watershed management — Definition of watershed management — Identification of problems - Watershed approach in Government programmes — People’s participation – Entry point activities - Evaluation of watershed management measures.

OUTCOMES:
The students will be able to
- Gain knowledge on various processes involved in participatory water resource management.
- Understand farmers participation in water resources management.
- Aware of the issues related to water conservation and watershed development
- Get knowledge in participatory water conservation
- Understand concept , principle , approach of watershed management.

TEXTBOOKS:

REFERENCE:

OAI553  PRODUCTION TECHNOLOGY OF AGRICULTURAL MACHINERY  
L T P C 3 0 0 3

OBJECTIVES:
- To understand the concept and basic mechanics of metal cutting, working of standard machine tools, such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching.
- To understand the basic concepts of Computer Numerical Control (CNC) machine tool and CNC programming.

UNIT I  ENGINEERING MATERIALS  

UNIT II  MACHINING  
Basic principles of lathe - machine and operations performed on it. Basic description of machines and operations of Shaper-Planner, Drilling, Milling & Grinding.
UNIT III  WELDING

UNIT IV  ADVANCED MANUFACTURING PROCESS
Abrasive flow machining - abrasive jet machining - water jet machining - Electro Discharge Machining (EDM) - Wire cut EDM - Electro Chemical Machining (ECM) - Ultrasonic Machining / Drilling (USM / USD) - Electron Beam Machining (EBM) - Laser Beam Machining (LBM).

UNIT V  CNC MACHINE

TOTAL: 45 PERIODS

OUTCOME:
• Upon completion of this course, the students can able to apply the different manufacturing process and use this in industry for component production.

TEXTBOOKS:

REFERENCES:

ORO551  RENEWABLE ENERGY SOURCES

OBJECTIVES:
• To get exposure on solar radiation and its environmental impact to power.
• To know about the various collectors used for storing solar energy.
• To know about the various applications in solar energy.
• To learn about the wind energy and biomass and its economic aspects.
• To know about geothermal energy with other energy sources.

UNIT I  PRINCIPLES OF SOLAR RADIATION
Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT II  SOLAR ENERGY COLLECTION
Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.
UNIT III  SOLAR ENERGY STORAGE AND APPLICATIONS  7
Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications-
solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT IV  WIND ENERGY  10
Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz
criteria BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas
digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine
operation and economic aspects.

UNIT V  GEOTHERMAL ENERGY:  9
Resources, types of wells, methods of harnessing the energy, potential in India. OCEAN
ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and
wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.
DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, principles of DEC.

TOTAL : 45 PERIODS

OUTCOMES:
- Understanding the physics of solar radiation.
- Ability to classify the solar energy collectors and methodologies of storing solar energy.
- Knowledge in applying solar energy in a useful way.
- Knowledge in wind energy and biomass with its economic aspects.
- Knowledge in capturing and applying other forms of energy sources like wind, biogas and
geothermal energies.

TEXT BOOKS:

REFERENCES:
2. Ramesh R & Kumar K.U , “Renewable Energy Technologies”, Narosa Publishing House,
2004
2003
P.H.I, New Delhi, 2010

OAI751  AGRICULTURAL FINANCE, BANKING AND COOPERATION  L T P C  3 0 0 3

OBJECTIVES:
- To make the students aware about the agricultural Finance, Banking and Cooperation.
- To acquaint the students with the basic concepts, principles and functions of management.
- To understand the process of finance banking and cooperation.

UNIT I  AGRICULTURAL FINANCE - NATURE AND SCOPE  9
Agricultural Finance: Definition, Importance, Nature and Scope - Agricultural Credit: Meaning,
Definition, Need and Classification - Sources of credit - Role of institutional and non - Institutional
agencies: Advantages and Disadvantages - Rural indebtedness: consequences of rural
indebtedness - History and Development of rural credit in India.
UNIT II  FARM FINANCIAL ANALYSIS
Principles of Credit - 5C’s, 5R’s and 7P’s of Credit - Project Cycle and Management - Preparation of bankable projects / Farm credit proposals - Feasibility - Time value of money: Compounding and Discounting - Appraisal of farm credit proposals - Undiscounted and discounted measures - Repayment plans - Farm Financial Statements: Balance Sheet, Income Statement and Cash Flow statement - Financial Ratio Analysis.

UNIT III  FINANCIAL INSTITUTIONS
Institutional Lending Agencies - Commercial banks: Nationalization, Agricultural Development Branches - Area Approach - Priority Sector Lending - Regional Rural Banks, Lead bank, Scale of finance - Higher financial institutions: RBI, NABARD, AFC, ADB, World Bank and Deposit Insurance and Credit Guarantee Corporation of India - Microfinance and its role in poverty alleviation - Self-Help Groups - Non-Governmental Organizations - Rural credit policies followed by State and Central Government - Subsidized farm credit, Differential Interest Rate (DIR), Kisan Credit Card (KCC) Scheme - Relief Measures and Loan Waiver Scheme and Know Your Customer (KYC).

UNIT IV  CO-OPERATION
Co-operation: Philosophy and Principles - History of Indian Cooperative Credit Movement: Pre and Post-Independence periods and Cooperation in different plan periods - Cooperative credit institutions: Two tier and three tier structure, Functions: provision of short term and long term credit, Strength and weakness of cooperative credit system, Policies for revitalizing cooperative credit: Salient features of Vaithiyananthan Committee Report on revival of rural cooperative credit institutions, Reorganisation of Cooperative credit structure in Andhra Pradesh and single window system and successful cooperative credit systems in Gujarat, Maharashtra, Punjab etc. - Special cooperatives: LAMPS and FSS: Objectives, role and functions - National Cooperative Development Corporation (NCDC) and National Federation of State Cooperative Banks Ltd., (NAFSCOB) - Objectives and Functions.

UNIT V  BANKING AND INSURANCE

TOTAL: 45 PERIODS

OUTCOME:
After completion of this course, the students will
• Be familiar with agricultural finance, Banking, cooperation and basic concepts, principles and functions of management.

REFERENCES:
OBJECTIVES:
- To understand the basics of weather and climate
- To have an insight on Atmospheric dynamics and transport of heat
- To develop simple climate models and evaluate climate changes using models

UNIT I  BASICS OF WEATHER AND CLIMATE:

UNIT II  ATMOSPHERIC DYNAMICS:

UNIT III  GLOBAL CLIMATE

UNIT IV  CLIMATE SYSTEM PROCESSES

UNIT V  CLIMATE CHANGE MODELS

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course the student will be able to understand
- The concepts of weather and climate
- The principles of Atmospheric dynamics and transport of heat and air mass
- The develop simple climate models and to predict climate change

TEXTBOOKS:
OBJECTIVE:

- To impart the knowledge and skills to identify, assess and mitigate the environmental and social impacts of developmental projects

UNIT I INTRODUCTION

UNIT II ENVIRONMENTAL ASSESSMENT
Screening and Scoping in EIA – Drafting of Terms of Reference, Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise, flora and fauna - Matrices – Networks – Checklist Methods - Mathematical models for Impact prediction.

UNIT III ENVIRONMENTAL MANAGEMENT PLAN

UNIT IV SOCIO ECONOMIC ASSESSMENT
Baseline monitoring of Socio economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit Analysis-

UNIT V CASE STUDIES

TOTAL: 45 PERIODS

OUTCOMES:
The students completing the course will have ability to

- carry out scoping and screening of developmental projects for environmental and social assessments
- explain different methodologies for environmental impact prediction and assessment
- plan environmental impact assessments and environmental management plans
- evaluate environmental impact assessment reports

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To provide an insight to the basics of planetary Remote Sensing
- To demonstrate how the Remote Sensing technique is applied to explore the surface characteristics of the planets and its environ.

UNIT I PLANETARY SCIENCE

UNIT II SATELLITE ORBIT

UNIT III PROPERTIES OF EMR

UNIT IV RADIOMETRY AND SCATTEROMETRY

UNIT V PLANETARY APPLICATION
Planetary Imaging Spectroscopy- USGS Tetracoder and Expert system - Mars Global Surveyor Mission (MGS) – Digital Elevation Model(DEM) of Mars – Mars Orbiter Camera (MOC) – Stereo and photoclinometric techniques for DEM.

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course, the students have
- Exposure to fundamentals of planetary science or orbital mechanics
- The principles of observing the planets
- Knowledge of Remote Sensing methods for determining surface elevation and mapping of planets.

REFERENCES:
OME754  INDUSTRIAL SAFETY  L T P C  3 0 0 3

OBJECTIVES:
- To impart knowledge on safety engineering fundamentals and safety management practices.

UNIT I  INTRODUCTION  9
Evolution of modern safety concepts – Fire prevention – Mechanical hazards – Boilers, Pressure vessels, Electrical Exposure.

UNIT II  CHEMICAL HAZARDS  9
Chemical exposure – Toxic materials – Ionizing Radiation and Non-ionizing Radiation - Industrial Hygiene – Industrial Toxicology.

UNIT III  ENVIRONMENTAL CONTROL  9
Industrial Health Hazards – Environmental Control – Industrial Noise - Noise measuring instruments, Control of Noise, Vibration, - Personal Protection.

UNIT IV  HAZARD ANALYSIS  9
System Safety Analysis –Techniques – Fault Tree Analysis (FTA), Failure Modes and Effects Analysis (FMEA), HAZOP analysis and Risk Assessment

UNIT V  SAFETY REGULATIONS  9

TOTAL: 45 PERIODS

OUTCOMES:
- Students must be able to identify and prevent chemical, environmental mechanical, fire hazard through analysis and apply proper safety techniques on safety engineering and management.

TEXT BOOK:

REFERENCES:

OAi752  INTEGRATED WATER RESOURCES MANAGEMENT  L T P C  3 0 0 3

OBJECTIVE:
- To introduce the students to the interdisciplinary analysis of water and conceptual design of intervention strategies.
- To develop a knowledge-base on capacity building on IWRM.

UNIT I  IWRM FRAMEWORK  9
Definition – Objectives – Principles - Evolution of IWRM - IWRM relevance in water resources management – Paradigm shift : Processes and prospective outcomes

UNIT II  CONTEXTUALIZING IWRM  9
UN formulations - SDG goals - IWRM in Global, Regional and Local water partnership – Institutional transformation - Bureaucratic reforms - Inclusive development
UNIT III  EMERGING ISSUES IN WATER MANAGEMENT  
Emerging Issues — Drinking water management in the context of climate change - IWRM and irrigation - Flood – Drought – Pollution – Linkages between water, health and poverty

UNIT IV  IWRM AND WATER RESOURCES DEVELOPMENT IN INDIA  
Rural Development - Ecological sustainability- -Watershed development and conservation - Ecosystem regeneration – Wastewater reuse - Sustainable livelihood - Food security

UNIT V  ASPECTS OF INTEGRATED DEVELOPMENT  
Capacity building - Conceptual framework of IWRM – Problems and policy issues - Solutions for effective integrated water management - Case studies

TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to
- Understand objectives, principles and evolution of integrated water resources management.
- Have an idea of contextualizing IWRM
- Gain knowledge in emerging issues in water management, flood, drought, pollution and poverty.
- Understand the water resources development in India and wastewater reuse.
- Gain knowledge on integrated development of water management.

TEXTBOOKS:

REFERENCES:

OTT752  TEXTILE EFFLUENT TREATMENTS  

OBJECTIVES:
- To impart awareness about the pollution created by different stages of wet processing
- To familiarize the students about the importance of water and its analysis
- To enable the students to understand about the waste water treatment plants and various treatments carried out

UNIT I  
Constituents of water and their effect on textile wet processing, Effluent discharge standards for inland surface water public sewers, on land for irrigation, marine coastal areas and drinking water parameters, Quality requirements of water for cotton and synthetic Textile processing.
UNIT II
Characteristics and treatment of cotton, synthetics and wool processing effluents, Reduction of pollution load, Primary treatment methods - screening, sedimentation, equalisation, neutralisation, coagulation and flocculation.

UNIT III
Secondary treatment methods – Trickling filtration, Activated sludge process, aerated lagoons, secondary sedimentation, oxidation ponds, Anaerobic Digestion, sludge disposal.

UNIT IV
Tertiary treatment – Evaporation (solar and steam), Advanced oxidation system, Membrane technologies (MF, UF, NF & RO), Reverse osmosis, ion exchange and activated carbon treatment. Quality parameters at entry and exit of RO.

UNIT V
Air Pollution - Properties of air pollutants, control of air pollutants – Air pollution control equipment, Ambient air quality standards. Noise pollution – Types of noise – Noise measurement and – Control of noise pollution.

TOTAL : 45 PERIODS

OUTCOMES:
- Upon completion of the course, the students will be able to
- Understand the textile processing related causes for pollution
- Understand the effluent discharge standards and different processes involved in waste water treatment
- Perform the research and development to produce zero discharge effluents

TEXTBOOKS:

REFERENCES: